

REMARKS

The Applicants appreciate the thoroughness with which the subject application has been examined and the indication of allowable subject matter in claims 5, 7-9, 13 and 15-20. By this amendment, changes have been made in the specification and in certain claims to overcome the Examiner's rejections and objections and more concisely claim and describe the present invention. Claims 1-20 remain in the application for reconsideration by the Examiner. The Examiner's allowance of all pending claims is earnestly solicited.

MATTERS RELATED TO THE SPECIFICATION

As indicated above, the Applicants have amended certain drawing descriptions in the Brief Description of the Drawings section. It is respectfully requested that these amendments overcome the Examiner's objection to the specification.

MATTERS RELATED TO THE CLAIMS

The Examiner has objected to claims 1, 8, 10 and 15 due to certain informalities as set forth in paragraph 3 of the Office Action.

The Applicants propose to overcome these informality objections by adopting the Examiner's suggestions for amending claims 1, 8, 10 and 15, as indicated above in the marked-up version of the claims.

Claims 1-4 and 6 stand rejected under Section 103(a) as unpatentable over Ooka (JP 8- 162424) in view of Tsuchiaki (5,444,007).

To further define the invention over the cited prior art, the Applicants have amended claim 1 as set forth above in the marked-up version of the claim. In particular, the Applicants have amended the claim to include, "performing a first tilted ion implantation through the first material line, wherein the ion beam intersects the first material line at an angle with respect to the top surface of the semiconductor layer such that an ion beam passes through the first material line prior to striking the doped semiconductor region, and wherein an implanted ion dosage reaching the doped semiconductor region to increase the dopant concentration thereof is dependent on the ion transmission properties of the material

line.” Support for this change can be found in the specification as originally submitted at page 8 beginning at line 13.

Ooka, as best understood, relates to a tilted ion implant for doping a semiconductor substrate. Tsuchiaki discloses, “ions of the etchant fluorine are used to bombard the semiconductor substrate 10 and resist pattern 20 at a tilt angle α The fluorine ions strike the top part of the resist pattern adjacent windows 31-35. Accordingly, areas of the semiconductor substrate 10 exposed through windows 31-35 are not implanted with ions. The angle α is sufficient to permit the fluorine ions to strike the semiconductor substrate 10 through windows 36 and 37.” See Tsuchiaki’s Figure 3C.

Neither Ooka nor Tsuchiaki alone or in combination discloses the Applicants’ invention as set forth in amended claim 1, including, “an implanted ion dosage reaching the doped semiconductor region to increase the dopant concentration thereof [is] dependent on the ion transmission properties of the material line.”

Further, it is respectfully submitted that there is no reference in Ooka or Tsuchiaki that discloses, suggests or motivates combining their respective disclosures to disclose or suggest the Applicants’ invention as set forth in amended claim 1. The Examiner merely hypothesizes as to the combinability of the two references based on analogous art and comments that it would have been obvious to combine the references, “to form different material line widths as taught by Tsuchiaki before performing the tilted ion implantation of Ooka since by this manner it would be able to control a desired doping density.” But Ooka relates to dopant implants and dopant density, whereas Tsuchiaki relates to implanting an etchant to control a trench profile. Clearly these are not related processes. Additionally, the Examiner mischaracterizes Tsuchiaki as teaching, “form[ing] different material line widths . . . to control a desired doping density.” In fact, it is not Tsuchiaki’s line widths that control the etchant implant, but instead the distance between the lines. See Tsuchiaki’s Figure 3C where, “windows 31-35 [i.e., a distance W1 between lines] may be formed . . . where it is desired to have trenches having a first characteristic profile, and windows 36 and 37 [i.e., a distance W2 between lines, where W2 is greater than W1] may be formed . . . where it is desired to have trenches having a second characteristic profile.”

Thus it is respectfully submitted that amended claim 1 is allowable over the art of record.

As to dependent claims 2, 3, 4 and 6 rejected under Section 103(a), the Applicants contend that each of these claims, depending from amended claim 1, includes one or more elements that further distinguish the invention over the art of record. These claims should therefore be in condition for allowance.

Claims 5 and 7-9 (dependent directly or indirectly from claim 1) have been objected to as being dependent on a rejected base claim but would be allowable if rewritten in independent form including the limitations of the base claim and any intervening claims. The Applicants appreciate the Examiner's indication of allowable subject matter in these claims. However at this point in the prosecution process the Applicants respectfully suggest that these claims are in condition for allowance based on the amendments to claim 1 and the remarks and discussion above in which the Applicant's invention as set forth in claim 1 is distinguished from the cited references. Thus the rewriting of these claims is held in abeyance pending the Examiner's reconsideration of these claims.

Claims 10-12 and 14 stand rejected under Section 103(a) as unpatentable over Ooka (JP 8- 162424) in view of Tsuchiaki (5,444,007).

To further define the invention over the cited prior art, the Applicants have amended independent claim 10 as set forth above in the marked-up version of the claim. In particular, the Applicants have amended the claim to include, "performing an ion implantation wherein an ion beam intersects the material line at an angle with respect to the top surface of the semiconductor layer such that the ion beam passes through the material line prior to striking the proximate semiconductor region, and wherein the implanted ions further increase the doping concentration of the doped semiconductor region, as determined by the ion transmissive properties of the material line."

As described above with respect to the rejection of claim 1, Ooka, as best understood, relates to a tilted ion implant for doping a semiconductor substrate and Tsuchiaki discloses, "implanting an etchant such as fluorine, and "the fluorine ions cannot pass through narrower resist windows but can pass through wider resist windows to impinge on the underlying semiconductor substrate."

Neither Ooka nor Tsuchiaki alone nor in combination discloses the elements of the Applicants' invention as set forth in amended claim 10, including, "wherein the implanted ions further increase the doping concentration of the doped semiconductor region, as determined by the ion transmissive properties of the material line."

Dependent claims 11, 12 and 14, dependent from independent claim 10, stand rejected under Section 103(a). The Applicants contend that each of these claims includes one or more elements that further distinguish the invention over the art of record. These claims should therefore be in condition for allowance.

Claims 13, dependent from claim 10, has been objected to as being dependent on a rejected base claim but would be allowable if rewritten in independent form including the limitations of the base claim and any intervening claim. The rewriting of this claim is held in abeyance pending the Examiner's reconsideration of claim 10 from which claim 13 depends.

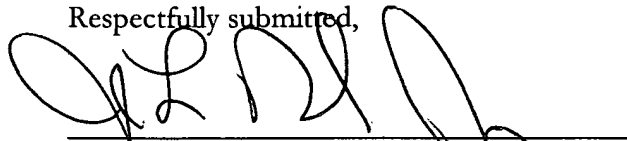
As set forth above, claim 15 has been amended to overcome the objection thereto and should now be in condition for allowance.

Dependent claims 16-20 dependent from independent claim 15 have been objected to but would be allowable if rewritten in independent form including the limitations of the base claim and any intervening claim. Based on the amendments to claim 15, these claims should now be in condition for allowance.

The Applicants have attempted to comply with all of the points raised in the Office Action and it is believed that the remaining claims in the application, i.e., claims 1-20 are now in condition for allowance. In view of the foregoing amendments and discussion, it is requested that the Examiner's rejections and objections have been overcome. It is respectfully requested that the Examiner reconsider these rejections and issue a Notice of Allowance for all the claims pending in the application.

If a telephone conference will assist in clarifying or expediting this Amendment or the claim changes made herein, the Examiner Lee is invited to contact the undersigned at the telephone number below.

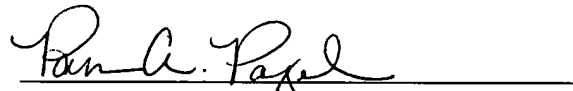
Respectfully submitted,



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CERTIFICATE OF MAILING

I HEREBY CERTIFY that a true and correct copy of the foregoing Amendment is being deposited with the U.S. Postal Service as first class mail in an envelope addressed to: Mail Stop Amendment, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on this 15th day of March 2005.



Pamela A. Pagel